

EAST TEXAS FOREST ENTOMOLOGY SEMINAR
April 20-21, 2017

Thursday, April 20, 2017, Kurth Lake
Moderator: Ron Billings

AGENDA

- 12:00 – 1:00 PM Registration**
- 1:00 – 1:10 PM Welcome and Introductions**
- 1:10 – 1:30 PM East Texas Forest Entomology Seminar: Where do we go from here?**
Open Discussion
- 1:30 – 2:00 PM SPB Expands its Range: Out of the Frying Pan into the Flyer**
Speakers: Fred Stephen and Larry Galligan, University of Arkansas, Jim Gulden,
USFS, Southern Research Station

Historically population levels of southern pine beetle (SPB) have fluctuated in pine stands across the South. To better understand the causes of these changes we sampled within-tree SPB populations for 15 years (1975-1997) across five states, including 47 plots, and totalling 762 trees. This research produced what is arguably the most detailed database for tree-level populations of SPB, and it's natural enemies, available to date. This presentation describes difficulties of our sampling operation, how we have handled and stored the data collected, and how we intend for the database to be accessible to others in the future. Challenges inherent in our sampling included climbing trees and implementing different sampling procedures for specific SPB life stages, and for their natural enemies. Many variables influence SPB-related density estimates including infestation size, season of the year, increasing or decreasing infestation growth, and forest stand conditions in which infestations occur. The complexity of the gathered data is compounded by spatial scales from infestation-level to small bark samples cut and removed from trees; field collected data that are transported to a lab for analysis, and thousands of samples, on each of which can be measured more than a hundred possible variables.

We suggest that natural enemies may be an important driver of SPB population change. We propose a hypothesis that SPB abundance can be strongly influenced by the abundant and stable complex of its natural enemies. Natural enemies include 12 or more predator species; eight or more parasitoid species; plus three *Ips* species and *Monochamus* competitors/facultative predators. Nearly all species of SPB predators and parasitoids also attack and can develop on *Ips* species. We present evidence from our database as to the stability of these complexes through the years of our data collection. Others have proposed that density dependent processes are important in explaining observed changes in SPB populations over time, but they have generally only one predator, the clerid *Thanasimus dubius*. We suggest that natural enemies collectively respond through positive feedback to SPB-killed trees. In newly mass-attacked SPB trees, phloem becomes available to not only SPB, but also *Ips* species and *Monochamus* species. Both groups are strongly attracted to new hosts by α -pinene and *Ips* pheromones. Both groups of organisms are better competitors than SPB, and the more pines killed by SPB, the greater the numerical response of this natural enemy complex. *Monochamus*, at high population levels, will attack trees simultaneously with SPB and when this happens the *Monochamus* larvae win the asymmetric competition that exists with phloem feeding bark beetle larvae and this can drive SPB to local extinction. Because SPB need a sufficient area-wide population to successfully mass attack trees, if their density becomes too low, they will drop below the "Allee threshold" and move toward local extinction. We hypothesize that since 1998, this has happened to SPB populations west of the Mississippi River—and that a new influx of SPB, from unknown sources, would be necessary before SPB populations again begin to grow in the ARLATX region. Should that occur, the event would be significant, given the presence of millions of acres of planted pine stands in the region that have been established in the past two

decades, many of which are managed at basal areas greater than 100 ft²/ac and thus would rate as high hazard for SPB.

2:00 – 2:30 PM A Working Forester’s Experience with SPB in Southern New Jersey: Detection, Prevention, and Suppression on Private Forest Lands within the Pinelands National Reserve

Speaker: Bob Williams, Certified Forester and President, Pine Creek Forestry, LLC., Laurel Springs, NJ.

2:30 – 3:00 PM Reflections on my 44-year Career with the Texas A&M Forest Service

Speaker: Ron Billings, Texas A&M Forest Service

Using photos from his files, Ron summarized the highlights of his 44-year career as Principal Entomologist and Head, Forest Pest Control Section of the Texas Forest Service (now Texas A&M Forest Service). He included his involvement in applied research on southern pine beetle (seasonal behavior, infestation dynamics, developing the SPB prediction system, hazard rating, cut-and-leave, verbenone and emamectin benzoate evaluations, etc.). From 1982-2015, he developed and administered the Cooperative Oak Wilt Demonstration and Suppression Project in Central Texas. Since 1982, Ron has provided technical assistance in forest insect management to a variety of third world countries, including Honduras, Guatemala, Nicaragua, El Salvador, Mexico, Chile, Dominican Republic, Haiti, and Vietnam. He also acknowledged colleagues he has worked with over the last 4 decades.

3:00 – 3:30 PM Break

3:30 – 4:00 PM A Tribute to Dr. Tom Payne on Occasion of his Retirement

Speaker: Robert Coulson, Texas A&M University

Abstract: Dr. Thomas L. Payne began his remarkable career journey in The Department of Entomology at Texas A&M University as an Assistant Professor of Forest Entomology in 1968. He matriculated through the ranks to earn the title of Professor. During his 16 year tenure he became internationally recognized research scientist and scholar, trained students who became leaders in entomology, taught several generations of Aggies, and participated in the administration of the ESPBRAP(the first substantial research program in forest entomology in the South). He was recruited by Virginia Tech University to lead the Department of Entomology. As Professor and Head he guided the Department into a position of National prominence in a period of only five years. Building on his experience and success in the professorial ranks and department administration, Dr. Payne advanced to become Director of the Ohio Agricultural Research and Development Center (OARDC), Associate Dean for Research (College of Food, Agricultural, and Environmental Sciences, and Associate Vice President Agricultural Administration (The Ohio State University). He inherited a financially challenged OARDC and, again, in a period five years led this program back to National prominence. The next progression in Dr. Payne’s career led to the University of Missouri as Vice Chancellor and Dean. He provided leadership for this outstanding program for 17 years, a tenure substantially beyond the “life span” of individuals with his rank.

As a friend and colleague of Dr. Payne for 47 years, I have followed closely the accomplishments of his remarkable journey and am honored to have had the privilege of tracing the path for the ETFES.

4:00 – 4:30 PM In Memory of Dr. Pierre “Peter” Vité

Speaker: Ron Billings and Joe Pase, Texas A&M Forest Service

A collage of photos, combined with personal recollections from Ron Billings, Joe Pase, and other seminar participants, was used to pay tribute to a friend, colleague and mentor, Dr. J. P. “Peter” Vité, died in June, 2016 at the age of 93. Peter was an outstanding forest entomologist who administered the Southern Forest Research Institute in Sour Lake from 1963-1974). His pioneering research resulted in isolation and identification of frontalin, the principal aggregation pheromone for the southern pine beetle (SPB), *Dendroctonus frontalis*. He and members of his staff conducted applied field research providing insight into SPB flight behavior, response to aggregation pheromones, infestation growth and decline, predator-prey relationships, and other important aspects of SPB behavior. Peter also was a charter member of the East Texas Forest Entomology Seminar and his contributions were recognized at the 20th anniversary meeting in 1993. An obituary published in the winter 2016 edition of *American Entomologist* provides more details on his remarkable life and career in forest entomology.

4:30 – 5:00 PM Other Comments on Recently Passed or Retiring Forest Entomologists We Know

Open Forum: Robert Coulson, Texas A&M University, Fred Stephen (U. of Arkansas), Ron Billings (Texas A&M Forest Service), David Kulhavy (Stephen F. Austin State U.), Stephen Clarke (USFS/FHP), and others.

5:00 – 6:00 PM Attitude Adjustment and Horseshoes

6:00 PM Dinner (Crawfish boil)

7:30 PM Patagonia – the Best of Argentina
Slide show by Ron Billings, Texas A&M Forest Service

Friday, April 21, 2017 SFASU Forestry School, Room 117

Moderator: Dave Kulhavy

FINAL AGENDA (Continued)

7:45 – 8:00 AM Refreshments

8:00 – 8:30 AM Contradictions in Camper Attitudes and Actions in the Movement of Recreational Firewood

Speakers: Matthew J. Thorn, John J. Riggins, Richard L. Brown, and Jason Gordon,
Mississippi State University

The results of a survey of campers' attitudes and actions towards movement of non-native woodborers in recreational firewood, and invasive species management in Mississippi State Parks were presented. Nearly half of campers were aware of invasive insects being transported in firewood, but recognition of common names varied widely by species. Greater than 60% of campers reported that it was very important to stop the spread of invasive woodborers, however only 31% of campers reported purchasing firewood close to campgrounds and greater than 70% reported bringing firewood into campgrounds more than twice a year. Possible causes and solutions for the discrepancy are discussed, including creating a culture where invasive species management is the social norm and increasing camper feelings of connectedness to the areas being damaged.

8:30 – 9:00 AM Silvicultural Management of the Hemlock Woolly Adelgid

Speaker: Robert Jetton, North Carolina State University

Since its introduction in the early 1950s, the exotic-invasive insect hemlock woolly adelgid (HWA, *Adelges tsugae*) has caused widespread decline and mortality of eastern hemlock (*Tsuga canadensis*) and Carolina hemlock (*T. caroliniana*) throughout the Southern Appalachian Mountains. Research and development activities targeted at developing an integrated pest management strategy for HWA have focused on classical biological control, chemical control with the systemic insecticide imidacloprid, genetic resource conservation, and resistance breeding. Despite much progress, an effective IPM strategy to slow the spread and impact of the adelgid remains elusive and hemlock decline and mortality continues unabated. Efforts to manage HWA populations are now focused less on saving trees and more on developing integrated IPM and silvicultural strategies for the recovery and restoration of degraded hemlock ecosystems. One factor that may play a significant role in the development of silvicultural restoration strategies is the influence that increase crown light exposure has on HWA population density. Anecdotal reports from forest, seed orchard, and ornamental settings indicated that open grown trees or portions of canopy dominant trees that receive abundant sunlight exposure support very low adelgid population densities. This was confirmed in experimental studies with potted eastern hemlock seedlings exposed to varying levels of light intensity where HWA density decreased and seedling carbon balance improved with increasing light exposure (Brantley et al. 2017. Forest Ecology and Management. 385: 150-160). This relationship of canopy light exposure to adelgid population density is currently being tested in two field studies on hemlock restoration. The first is testing the effects of canopy structure (canopy gap versus thinned), deer exclusion, fertilization, and competition control with herbicides on the survival, establishment, and growth of eastern hemlock seedlings reintroduced to ecosystems where the species was previously eliminated by HWA. The second is testing the effects of increased light exposure on the health, survival, and growth of canopy intermediate eastern hemlocks through the creation of gaps of varying size via tree felling and girdling.

9:00 – 9:30 AM Physiological Effects on Native Subterranean Termites from Feeding on Wood Infected with Blue-Stain Fungi

Speakers: Natalie A. Dearing, N. Krishnan Clay, and John Riggins, Mississippi State University

Subterranean termites have many well-documented fungal symbionts, with relationships ranging from mutualistic to antagonistic. Until fairly recently, all fungi known to be capable of eliciting a positive feeding response from subterranean termites have been from the same group, Basidiomycota, and also typically contribute to the decay of woody debris. In 2012, a new fungal associate (ophiostomatoid fungi, or “blue stain” fungi) of subterranean termites was discovered. These ascomycete fungi were the first known non-basidiomycete fungi to elicit a positive feeding response in subterranean termites. Interestingly, ophiostomatoid fungi are also closely associated with bark beetles, the primary herbivore of pine trees. In addition to being in a separate phylum, ophiostomatoid fungi metabolize sugars, proteins, starches, and fats in the sapwood as opposed to cellulose and lignin like decay fungi in Basidiomycota. The findings of Little et al. from 2012 have been backed up by further research; however, the mechanisms behind this feeding response remain unknown. Proposed research was presented, which will be focusing on the physiological responses of native subterranean termites after feeding on wood infected with ophiostomatoid fungi. Objectives of this research are: 1.) determine if subterranean termites experience physiological changes after feeding on wood infected with ophiostomatoid fungi, and 2.) determine if the composition or abundance of symbiotic gut biota is altered after feeding on wood infected with ophiostomatoid fungi. Termites from three distinct colonies will be allowed to feed on wooden wafers for a duration of 15 or 30 days. Feeding will occur in separate feeding chambers and each chamber will contain one wafer that is either infected with ophiostomatoid fungi, is a sterile control, or is infected with only a negative control fungus (*Grossmania huntii*). Presence of cellulase 1-4, enzymes responsible for the breakdown of cellulose (wood fiber) in subterranean termites, will be examined using quantitative real time PCR. An increased presence of cellulase 1-4 in a treatment group of subterranean termites would indicate that the feeding medium for that group was being digested more easily. Additionally, a count of protists present in the gut of subterranean termites will be performed. The microbial communities within the gut of subterranean termites have been shown to change drastically with the quality of feeding medium, and will be good indicators of the nutritional quality of the wooden wafers.

9:30 – 10:00 AM Directed Undergraduate Research at SFASU Forestry: Drones, Pictometry and the Scholarship of Teaching and Learning

Speakers: David Kulhavy, Dan Unger and I-Kuai Hung, SFASU

The use of UAS (drones) was reviewed using video, single pictures and programmed flights for the DJI Phantom 3 and DJI Phantom 4. Use of the devices to fly the drones (cell phone, iPad mini, controller) were reviewed. Regulations for use of drones include FAA 336 for hobby flyers and training; and FAA 107 for use of air space (400 feet, use of an observer, line of sight); and the examination for a two year drone license—60 question test with a passing score of 70 percent and a background check. Use of the drones for detection was shown from a programmed flight that was downloaded with Drone2Map software for ArcGIS. Within the programmed flight, individual images can be viewed and use for detection. It is important to take individual pictures during a video flight as these can be magnified for detailed investigations. Use of the DJI Phantom 4 was reviewed for Ips mortality in a 12 year old pine plantation.

10:00 – 10:30 AM Break

10:30 – 11:00 AM Suppressing SPB Infestations on National Forests without Cut-and-Remove

Speaker: Stephen Clarke, USFS, Forest Health Protection

Abstract: Cut-and-remove and cut-and leave have been the most prominent methods of southern pine beetle (SPB) suppression over the past 40 years. Cut-and-remove typically was the treatment of choice as it is highly effective and provides a return to the landowner or agency. However, in the past 10+ years cut-and-leave has replaced cut-and-remove for SPB suppression, particularly on federal lands. This shift was due to reduced timber markets and self-imposed regulations. National Forests continue to manage loblolly pines in monocultures, which is not a natural or sustainable stand condition for this species. Given reduced budgets, current forest management strategies, and the loss of cut-and-remove, should SPB suppression remain an integral component of forest pest management in the South?

11:00 – 11:30 AM More than You Ever Wanted to Know about Bark Beetle Lures

Speakers: Brian Sullivan and Steve Clarke, US Forest Service

In a recent experiment it was observed that a high-rate release device (“sock”) of the host-odor component (*alpha*- and *beta*-pinene or turpentine) of an SPB lure was attractive to SPB in the absence of any pheromone lure. The cause for this anomaly was likely significant contamination of the host-odor lure with frontalin; this was discovered by chemical analyses of the odors being released from the anomalous host-odor device. The amount of contamination was relatively small (about 1/10,000) but nonetheless would have resulted in a release rate of frontalin sufficient to cause a response by SPB. It was concluded that the cross-contamination occurred while the lures were in storage within polyethylene bags in a freezer. We therefore performed some laboratory tests of the reliability of lure storage methods and the risks of cross contamination of lures while in storage. Non-replicated lab tests in which devices (centrifuge tubes) releasing either alpha-pinene or frontalin were stored at room temperature in the same air-tight enclosure demonstrated that major cross-contamination occurred within just a few days, although this occurred at much lower rates when the enclosure was placed in a freezer. We also found that polyethylene storage bags (such as available at supermarkets) had no ability to contain odors of lures of either compound; they passed as quickly through the bags as out of the lures themselves. Thus presumably polyethylene storage bags have no effect on reducing cross-contamination and are completely inadequate for lure storage. Ziplock mylar bags prevented escape of odors for several days, however afterward odors began to escape through the bags’ zipper closures (possibly made of polyethylene) at significant rates. This was stopped by sealing the mouth of the bag with an impulse (i.e., heat) sealer. We conclude that lure-cross contamination can have major consequences for beetle responses to baited traps. It is recommended that lures be stored in either mason jars or ziplock Mylar bags in a freezer, and that the mouths of the Mylar bags be heat-sealed if lures are to be stored for extended periods.

11:30 AM – 12: 00 PM Improving the SPB Prediction System

Speakers: Ron Billings, Texas A&M Forest Service, Steve Clarke, James Meeker, and John Nowak, US Forest Service/FHP, and John Riggins, Mississippi State University

Field evaluations to compare various attractive lures for use in improving the southern pine beetle (SPB) annual prediction survey were discussed. In collaboration with federal and University entomologists and with funding as a U. S. Forest Service STDP (Special Technology Development Project), a Latin square experimental design was used to test 6 different lure combinations in 8 different sites within 3 states (LA, MS, and AL) for attractiveness to SPB and clerids (*Thanasimus dubius*), a major predator. Results from field trials conducted for 10 weeks in the spring (February-April) of 2016 revealed that traps baited with a combination of frontalin, Caribbean pine turpentine and

endo-brevicomin (the latter displaced 4 m from the trap) caught ca. 60% of all SPB captured at each site. The second most attractive treatment was fronatlin + Sirex lure + *endo*-brevicomin (displaced by 4 m). Ironically, the fewest numbers of SPB were attracted to the lure consisting of frontalin + Sirex lure, the standard bait used for prediction purposes since 2005. Similar results were obtained when the bioassays were repeated on 10 sites in 4 states (LA, MS, AL and NC) during the fall (October-December, 2016). Accordingly, the SPB prediction chart was modified to account for these differences in attractiveness and to hopefully improve prediction accuracy. In future SPB prediction surveys, a combination of fronatlin + Sirex lure + *endo*-brevicomin (displaced by 4 m) will be recommended as the preferred lure, due to problems with availability and chemical consistency of the Caribbean turpentine as a host lure.

12:00 PM Adjourn